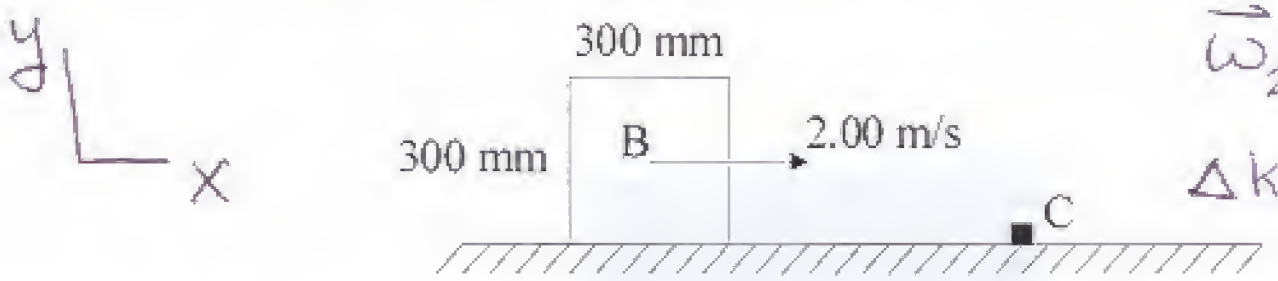
1. A 15 kg block B is moving along a frictionless horizontal surface at a constant speed of 2.00 m/s when it encounters a very small obstacle at C (fixed to the ground). The collision is perfectly plastic and the front lower edge of the block remains in contact with the obstacle during the impact.

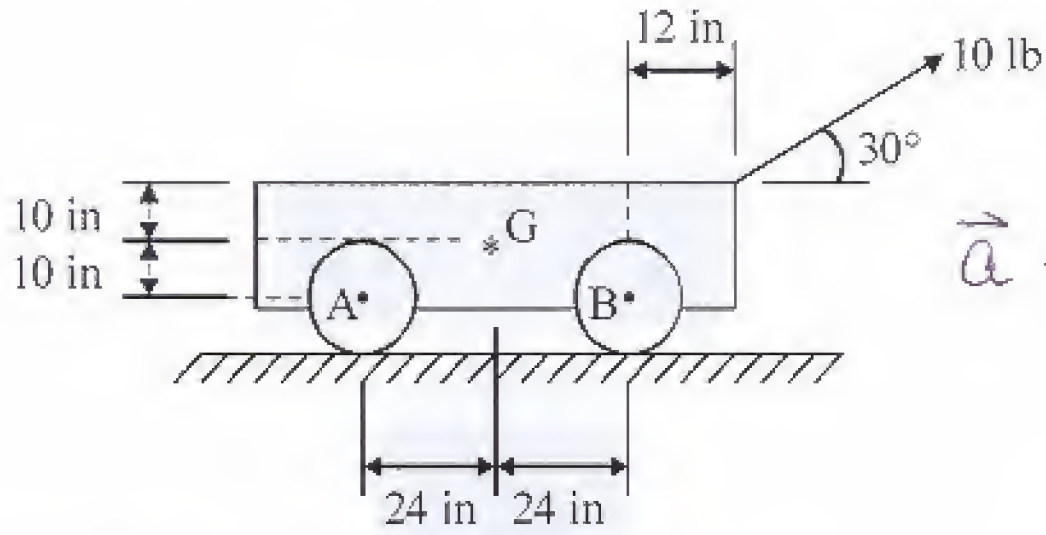



$\vec{\omega}_2 = -5\hat{k}$ rad/s

$\Delta KE = -18.75$ J

Determine the angular velocity of the block immediately after the impact, and the energy lost during the impact.

2. An assembly consists of four identical 5 lb disks (two disks on each side) pin connected at their centers to a 50 lb block with center of gravity G. Each disk has a diameter of 20 inches. The assembly is at rest when a 10 lb force is applied at an angle of 30°, as shown. The disks roll without slipping.

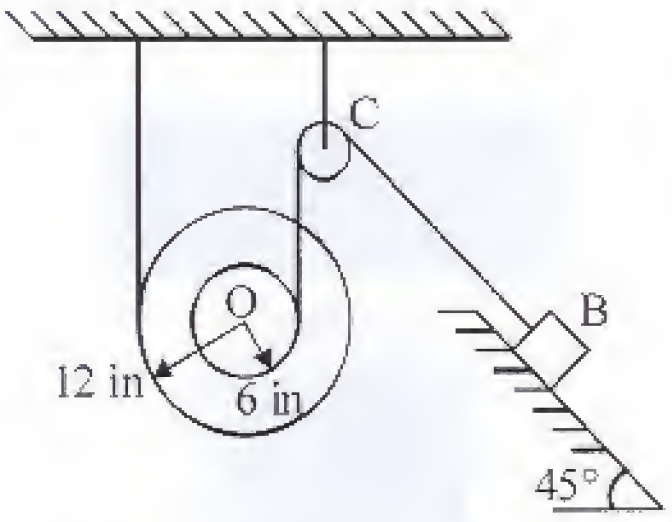



y
|— x

$\vec{a} = 3.49\,\hat{i}\ \frac{ft}{s^2}$

Determine the initial acceleration of the block.

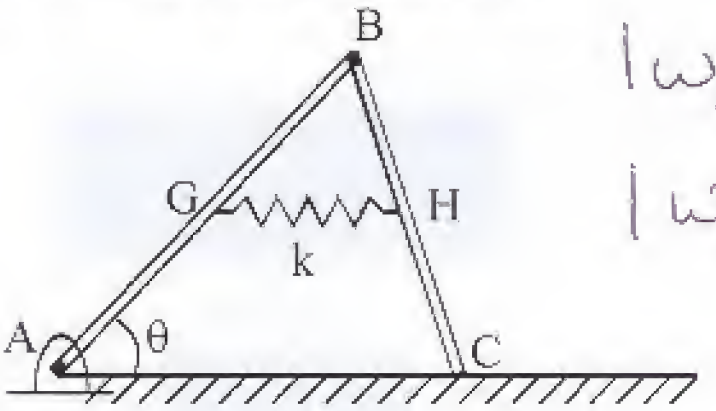
3. The 100 lb pulley has an inner radius of 6 inches, an outer radius of 12 inches, and a radius of gyration $k_O = 9$ inches. The 50 lb block B slides on a 45 degree surface for which the kinetic coefficient of friction is $\mu_k = 0.15$. The pulley at C is frictionless and has negligible mass. The system is released from rest.




$\vec{v}_o = 3.74 \frac{ft}{s} \downarrow$

Determine the velocity of point O once it has moved 18 inches downward. Assume the block B slides.

4. Rod AB has a mass of 40-kg, a length of 400 mm, is pin connected to a fixed point at end A, and is pin-connected to rod BC at end B. Rod BC has a mass of 30-kg and a length of 300 mm. End C slides along a frictionless horizontal surface. A spring of stiffness k = 1000 N/m is connected between the centers of mass of the two rods (G and H, respectively). The system is released from rest when θ = 45°. At θ = 45°, the spring is unstretched.

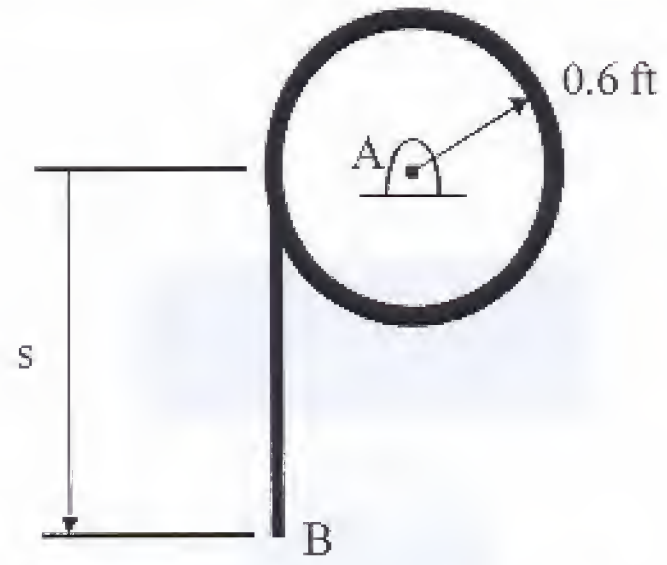



$|\omega_{AB}| = 2.56$ rad/s

$|\omega_{BC}| = 3.96$ rad/s

Determine the angular velocity of each rod when θ = 30°.

5. A drum has a weight of 50 lb and a radius of gyration $k_A = 0.4$ ft. A 35-ft cable having a weight of 2 lb/ft is wrapped around the outer surface of the drum so that a cable length of s = 3 ft is suspended as shown.




$|\omega| = 16.6 \frac{rad}{s}$

If the drum is originally at rest, determine its angular velocity after the end B has descended to s = 13 ft. Neglect the thickness of the cable. **Use the force-acceleration method.**